This exam is "open book and open notes" as long as these sources are your own. You may not borrow or share anything (calculators, text, notes, etc.).

1. Consider the following data: {1, 8, 9, 9, 11, 12, 13, 13, 21, 31}
(a) Construct a stem plot of the data.
(b) Describe the stem plot with respect to skewness (right or left), symmetry, modality.
(c) What is the five number summary of the data?
(d) Construct a box plot of the data.
(e) What is the sample mean?
(f) What is the sample standard deviation?

2. Consider the following probability distribution for the result of a single experiment:

X	-1	0	1	2
P(X)	.2	.3	.4	.1

(a) What is the expected value for the random variable?
(b) What is the standard deviation for the random variable?
(c) What is the probability that the cumulative result (sum) of two experiments will equal 2?

3. The result of a game of chance has a discrete probability distribution with an expected value of 1.2 and a standard deviation of 3. What is the probability that the average result of 40 of these games will exceed 1.3?

4. A tomahawk missile has a 35% chance of hitting a certain target. 15 missiles are launched at the target.
(a) What is the probability that 2, 3 or 4 of the missiles will hit the target?
(b) What is the expected number of missiles that will hit the target?
(c) What is the standard deviation for this distribution (for the 15 missiles)?

5. Consider the following normal distributions:

Distribution	Mean	Standard Deviation
X	13	4
Y	14	3

(a) What is the probability that X is greater than 10.1?
(b) What is the probability that X is greater than Y?

6. Consider the following (x , y) data pairs: (1 , 3), (2 , 5), (3 , 9).
(a) Find the best fit (linear regression) line.
(b) What is the correlation value?
(c) Is it possible to have a correlation value greater than 1.5?
(d) What is the predicted value of Y if X is 4?

7. A cigarette manufacturer claims that its cigarettes have an average of 1.5 mg of nicotine each. A laboratory tests a random sample of its cigarettes and finds a 95% confidence interval for the population mean nicotine to be 2.4 $\pm$ .8 mg.
(a) Is the sample evidence above significant enough at the $\alpha = 5\%$ level for you to reject $H_0: \mu = 1.5$ in favor of $H_a: \mu \neq 1.5$? Explain why.
(b) Is the sample evidence above significant enough at the $\alpha = 10\%$ level for you to reject $H_0: \mu = 1.5$ in favor of $H_a: \mu \neq 1.5$? Explain why.

8. An SAT preparation school claims that its course will increase a student's Math SAT score. A random sample of students who took the course shows increases in their Math SAT scores of 30, 10, 20, 10, 20, 10. Is there statistical evidence to support the school's claim?
(a) State H_0 and H_a.
(b) Conduct a test. Find its P-value. What is your conclusion?

9. The youngster class at the Naval Academy claims that its average time in the three mile run is faster than that of the plebe class. They base their claim on the fact that a random sample of 20 youngsters averaged 17.5 minutes with a sample standard deviation of 3.5 minutes, while a random sample of 15 plebes averaged 18.0 minutes with a sample standard deviation of 3.7 minutes. Is there statistical evidence to support the youngsters' claim?
(a) State H_0 and H_a.
(b) Conduct a test. Find its P-value. What is your conclusion?

10. An election polling service tests a random sample of 600 voters on election night and finds that 55% are in favor of a bill to increase the state speed limit. Is this significant evidence that the bill we succeed (get more that 50% of the state vote)?
(a) State H_0 and H_a.
(b) Conduct a test. Find its P-value. What is your conclusion?
(c) Find a 95% confidence interval for the proportion of voters in the state who will vote for the bill.
(d) At least how many voters would have to be polled in order to assure a 95 % confidence interval with a margin of error of no more that 2 % ?

11. Suppose that the state asks you to conduct a study to determine if there is a relationship between the type region (city or rural) a driver resides in and driver's license suspensions. Data for the past year is shown on the right. Is there statistical evidence to suggest that there is a relationship between region of residence and driver's license suspension?

license suspension	city	rural
yes	100	40
no	9900	1960

(a) State H_0 and H_a.
(b) Conduct a test. Find its P-value. What would you report to the state?

12. A random sample of 102 data pairs (x , y) is collected on newly constructed homes in the county. x = total floor area (ft^2) and y = cost of construction (dollars). A least squares regression line is found to be $\hat{y} = 20,000 + 120x$. The standard error of the slope is $SE_{b_1} = 45$.
(a) Find a 95% confidence interval for the slope β_1 of the population regression line.
(b) Based upon your answer to (a), is there significant evidence at the $\alpha = 5\%$ level of a linear relationship between x and y ?
(c) Briefly explain the practical meanings of β_1 and β_0 in this example. State their units in your explanation.